GP/1714

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): David E. Wallick, et al.

Serial No.: 09/608,585 Group Art Unit: 1714

Filed: June 30, 2000 Examiner: Unknown

For: LOW VISCOSITY ALKYL DIPHENYL OXIDE SULFONIC ACID BLENDS

#4
12/14/00
JC

I HEREBY CERTIFY THAT THIS CORRESPONDENCE IS BEING DEPOSITED WITH THE UNITED STATES POSTAL SERVICE AS FIRST CLASS MAIL WITH SUFFICIENT POSTAGE IN AN ENVELOPE ADDRESSED TO: ASSISTANT COMMISSIONER FOR PATENTS, WASHINGTON, DC 20231, ON:

November 8, 2000
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PRINT OR TYPE NAME OF PERSON SIGNING CERTIFICATE

Jennifer S. Havercamp
SIGNATURE OF PERSON SIGNING CERTIFICATE

November 8, 2000
DATE OF SIGNATURE

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

INFORMATION DISCLOSURE STATEMENT

Pursuant to Applicant's duty of disclosure under 37 CFR §1.56, the Examiner's attention is directed to the information identified in the attached Form PTO 1449. Even as the Examiner is requested to review each reference and formulate her/his own understanding thereof, a short mention of relevant summary information for each reference is respectfully also submitted in this Disclosure Statement.

A first reference respectfully submitted for consideration is the slide set from a presentation of the Institute of Applied Surfactant Research. The presentation of "Supersolubilization in Mono- and Dialkyl Diphenyloxidedisulfonate Solutions," by Bin We, Dave Sabatini, Jeff Harwell, and Jason Bailey of the University of Oklahoma on September 9, 1998 to the Institute of Applied Surfactant Research shows considerations in interphase behavior of DOWFAX, organic acid, salt, and water blends.

United States Patent 2,854,477, which issued on 9/30/58 to Steinhauer discusses a method of making alkyl diphenyl ether sulfonates.

United States Patent 2,990,375 which issued on 6/27/61 to Steinhauer and Velenta, referenced on pages 5 and 6 of the specification of the present invention, further describes early work of the inventor in US 2,854,477. A trilinear diagram showing a preferred "clear solution" domain shows a property specific region in three component blends where an alkyl diphenyl ether sulfonate is one of the components (see also Figure 4 in the present specification).

United States Patent 3,027,223, which issued on 3/27/62 to Teot is referenced on page 5 of the specification of the present invention and describes caustic mercerizing solutions beneficially enhanced with an alkylated diphenyloxide sulfonate.

United States Patent 3,264,242, which issued on 8/2/66 also to Teot, describes aqueous dispersions containing alkylated diphenyloxidedisulfonic acid and a non-ionic surface active agent.

United States Patent 3,634,272, which issued on 1/11/72 to Valenta et al. is referenced on page 5 of the specification of the present invention and describes further work by the inventors of US 2,990,375.

United States Patent 3,645,906 which issued on 2/29/72 to Valenta et al. presents further work by the inventors of US 3,634,272 describing that alkylated diphenyloxide sulfonic acid salt, alone if halogenated, or, if unhalogenated, then in combination with certain commercial surfactants, will solubilize into a clear solution (a) a hydrophobic liquid (e.g., chlorinated hydrocarbon) and water, or (b) a solution of an acid, base, or salt in water.

A number of references deal with management of petroleum viscosity. United States Patent 3,945,437, which issued on 3/23/76 to Chiu et al. is referenced on page 5 of the specification of the present invention and describes a process for displacing oil using aqueous anionic surfactant systems containing aromatic ether polysulfonates. (The properties of an aqueous surfactant system for displacing oil within a permeable medium are improved by adding an aromatic ether polysulfonate to the system. This improves the tolerance of the system toward salts of monovalent and/or multivalent cations, and also causes emulsions formed between the oil and the oil-displacing system to be less viscous and less stable.)

United States Patent 3,969,258, which issued on 7/13/76 to Carandang et al. discusses low foaming acid-anionic surfactant sanitizer compositions.

A further reference dealing with management of petroleum viscosity is United States Patent 4,013,569 which issued on 3/22/77 to Chiu et al. and which describes aqueous anionic surfactant systems containing aromatic ether polysulfonates. Columns 3 and 4 of this patent discuss considerations in interfacial tension activity and reference Dowfax surfactants as "particularly preferred" in the invention (see U.S. 3,945,437).

United States Patent 4,106,901, which issued on 8/15/78 to Bishop et al. presents an emulsifier-solvent scour composition and method of treating textiles therewith. (The scour compositions are an inert organic solvent media containing a specified phosphate ester, at least one C_8-C_{24} carboxylic acid or salt, and another material, e.g., a sulfonated alkyl diphenyl oxide or its salt.)

United States Patent 4,135,878, which issued on 1/23/79 to Bishop et al. further presents an emulsifier-solvent scour composition and method of treating textiles therewith. (see previous US 4,106,901)

United States Patent 4,269,749, which issued on 5/26/81 to Marriott et al. shows the stabilizing effect of alkyldiphenyl ether sulfonates on microsuspensions.

United States Patent 4,287,077 which issued on 9/1/81 to Wing discloses beneficial use of a glycol soluble ether modified silicone in improving gellation resistance of aqueous glycol or glycol ether compositions.

United States Patent 4,645,623, which issued on 2/24/87 to Dolan et al. discloses alkylaryl sulfonate compositions. (Alkylarylsulfonate compositions containing low 2-phenyl alkylbenzene sulfonates and alkylated diphenyl oxide sulfonates have improved solubility and detergency properties and are useful in aqueous base detergent formulations.)

United States Patent 4,687,593, which issued on 8/18/87 to Dolan et al. further discusses alkylaryl sulfonate compositions. (see previous U.S. 4,645,623).

United States Patent 4,701,276, which issued on 10/20/87 to Wyman presents super paramagnetic fluids and methods of making super paramagnetic fluids where colloidal suspensions are beneficially suspended using an aromatic sulfonic acid dispersing agent. Organic acids (see column 4 lines 30 to 39) are used to coat magnetic particles before the particles are treated with the dispersant salt of the aromatic sulfonic acid.

A further reference dealing with management of petroleum viscosity is United States Patent 4,757,833 which issued on 7/19/88 to Danley and which presents a method for improving production of viscous crude oil. (Improving the mobility and pipeline transport of a viscous crude oil by forming an oil-in-water emulsion with the oil and water in the presence of a surfactant blend.)

United States Patent 4,800,036, which issued on 1/24/89 to Rose et al. discusses aqueous bleach compositions thickened with a viscoelastic surfactant.

United States Patent 4,806,256, which issued on 2/21/89 to Rose et al. discloses water-based hydraulic fluids. (Water-based hydraulic fluids are thickened by admixing the fluid with a viscoelastic surfactant containing surfactant ions and organic counterions that associate with the hydraulic fluid to form the viscoelastic surfactant. Water-based hydraulic fluids are highly shear stable and do not experience substantial viscosity loss with an increase in temperature.)

A further reference dealing with management of petroleum viscosity is United States Patent 4,820,429 which issued on 4/11/89 to Lim which presents surfactant compositions for steamfloods (a synergistic mixture of an α-olefin sulfonate and an alkylated diphenyl oxide sulfonate component.)

United States Patent 4,950,424, which issued on 8/21/90 to van der Hoeven et al. discloses non-aqueous liquid detergent compositions containing di-sulphonic acids as deflocculants.

United States Patent 4,975,110, which issued on 12/4/90 to Puritch et al. discloses fatty acid based herbicidal compositions. (The herbicidal composition contains a fatty acid active ingredient, e.g., one or a mixture of alpha monocarboxylic fatty acids having a hydrocarbon chain with between 8 and 12 carbons, and at least one surfactant, e.g., salts of n-alkyl diphenyl oxide disulfonate; the concentrated formulation may be stored as a concentrate until ready for use.)

A further reference dealing with management of petroleum viscosity is United States Patent 5,000,262 which issued on 3/19/91 to Danzik which deals with viscosity control additives for foaming mixtures. (For the enhanced recovery of hydrocarbons from a hydrocarbon bearing reservoir during gas injunction into the reservoir, the at least periodic injection of steam and a foam-forming mixture into the reservoir; the foam-forming mixture comprises water, an effective foam forming amount of an alkyl aromatic sulfate component having an average molecular weight from about 400 to about 600, at least one alkyl group comprising 18 to 24 carbon atoms, and a viscosity control agent; the viscosity control agent comprises a surfactant which is present in an amount effective to prevent gelling of the mixture during storage.)

United States Patent 5,015,367 which issued on 5/14/91 to Klimpel et al. is referenced on page 5 of the specification of the present invention and discusses alkylated diaryl oxide monosulfonate collectors useful in the floatation of minerals (see Columns 5 and 6, "Commercial methods of preparation of the alkylated diphenyl oxide sulfonates generally do not produce species which are exclusively monoalkylated, monosulfonated, dialkylated or disulfonated...").

United States Patent 5,085,789, which issued on 2/4/92 to Yokouchi et al. discloses surfactants in ferrofluid compositions. Fine particles of ferromagnetic material in a liquid carrier for dispersing the ferromagnetic material with a surfactant(s) acting as a dispersant; fine ferromagnetic particles are uniformly and stably dispersed throughout the carrier which has low viscosity and is thermally very stable.

United States Patent 5,136,088, which issued on 8/4/92 to Farmer et al. presents a sulfonation process for viscous sulfonic acid. (Production of highly viscous alkylated sulfonated diphenyl ether is discussed. "Addition of acetic acid is known to increase the reaction yields as is known with other alkyl aryl feedstocks." (Column 2))

A further reference dealing with management of petroleum viscosity is United States Patent 5,203,411 which issued on 4/20/93 to Dawe et al. and which discloses an oil recovery process using a mobility control fluid comprising alkylated diphenyloxide sulfonates and foam forming amphoteric surfactants.

A further reference dealing with management of petroleum viscosity is United States Patent 5,273,682, which issued on 12/28/93 to Danzik and presents viscosity control additives for foaming mixtures. (see U.S. 5,000,262)

United States Patent 5,298,529, which issued on 3/29/94 to Narayanan describes a method of stabilizing aqueous microemulsions using a surface active hydrophobic acid as a buffering agent.

United States Patent 5,373,064, which issued on 12/13/94 to Konishi, et al., describes use of alkyldiphenyl ether disulfonic acid as a suspension stabilizer in chlorinated polyolefin manufacture.

United States Patent 5,585,341, which issued on 12/17/96 to Van Eenam presents cleaner/degreaser concentrate compositions. (Non-aqueous concentrates for use in preparing aqueous cleaner/degreasers containing a sparingly water soluble organic material, a solubilizing additive, and a coupler, in which the surfactant may be, e.g., dodecyl diphenyloxide disulfonic acid or sodium dodecyl diphenyloxide disulfonate.)

European Patent 875551 entitled "Liquid Acid Thickened Composition – Comprises Self Thickening System Comprising Zwitterionic Surfactant and Anionic Surfactant and Acid" which issued on 11/04/98 discloses a liquid acid thickened composition – a self thickening system comprising zwitterionic surfactant, an anionic surfactant, and an acid. Diphenyl oxide disulphonate surfactants are shown on page 7.

WO 94/05759 entitled "Cleaning Composition which includes a Sulfonated Alkylated Aromatic Surfactant and a Nonionic Surfactant" which published on 03/17/94 presents a cleaning composition which includes a sulfonated alkylated aromatic surfactant and a nonionic surfactant. Page 6 line 16 describes the use of fatty acids as one type of nonionic surfactant.

A further reference dealing with management of petroleum viscosity is Canadian Patent 2,050,627 entitled "Viscosity and Phase Separation Control Additives for Foaming C_{20-24}-Alkyl Aromatic Sulfonates, especially for Enhanced Petroleum Recovery" which issued on 03/08/92 and which discloses viscosity and phase separation control additives for foaming C_{20-24}-alkyl aromatic sulfonates, especially for enhanced petroleum recovery.

Australian Patent 9640857 entitled "Fabric Cleaning Composition. – Comprises Natural or Synthetic Tanning Agent, Surfactant and Buffer System Comprising Non-Oxidizing Agents" which

issued on 01/23/97 presents a fabric cleaning composition – a natural or synthetic tanning agent, surfactant and buffer system comprising non-oxidizing agents. (Non-oxidizing acid included in composition may be, e.g., acetic acid or propionic acid.)

Another reference dealing with management of petroleum viscosity is German patent 3,634,644 entitled "Improving the Mobility of Viscous Crude Oil – by Emulsifying in Water, using a specified mixture of Anionic or Amphoteric and Nonionic Surfactants, Permitting Increased Well Production" which issued on 04/30/87 and is enclosed with an English language translation. The patent describes improving the mobility of viscous crude oil – by emulsifying in water, using a specified mixture of anionic or amphoteric and nonionic surfactants and thus enabling increased well production.

Turning now to the non-patent publications, Carter, Tracee et al., "Increasing the Solubility Enhancement of Anionic DOWFAX Surfactants," Separation Science and Technology, 33(15), pp. 2363-2377, 1998 discusses solubility enhancement of DOWFAX components by adding alchohols and electrolytes.

"More Solutions to Sticky Problems – A Guide to Getting More from Your Brookfield Viscometer," Brookfield Engineering Laboratories, Inc., July, 1996 presents a concise review of number of considerations in management of viscosity, especially in section 4.7.

"Chapter 9 – Rheology," in Shaw, Duncan J., Introduction to Colloid and Surface Chemistry, 4th Edition, Butterworth-Heinemann Ltd., Oxford, UK (1992) reviews theoretical considerations in viscosity of systems and considerations in electroviscous effects in charged flexible chains (especially page 251).

Boese, Roland; Hans-Christoph Weiss, and Dieter Blaser, "The Melting Point Alternation in the Short-Chain n-Alkanes: Single-Crystal X-Ray Analyses of Propane at 30 K and of n-Butane to n-Nonane at 90 K," Angew. Chem. Int. Ed., 38 (7), 988-992 (1999) discusses fatty acid properties as a function of chain length.

Rosen, Milton J., Surfactants and Interfacial Phenomena, Second Edition, John Wiley & Sons, New York (1989) also presents detail in fatty acid, detergent, and aqueous blending.

Keenan, M. J. and M. A. Krevalis, "Carboxylic Acids (Survey)" in Kirk-Othmer Encyclopedia of Chemical Technology, 4th Edition, edited by Mary Howe-Grant Kroschwitz, John Wiley & Sons, New York (1992) presents fatty acid detail including miscibility in water (page 158).

Sjoberg, Marie and Torbjorn Warnheim, "Nonaqueous Surfactant Systems," Surfactant Science Series Volume 67, pp. 179-205, edited by Kuo-Yann Lai, Marcel Dekker Inc., New York

(1997) discusses surfactant aggregation in non aqueous polar solvents and liquid crystal formation. Phase diagrams (page 187 and ff) include water and nonionic surfactants as components.

Hoffman, Heinz and Werner Ulbricht, "Viscoelastic Surfactant Solutions," Surfactant Science Series Volume 70, pp. 285-324, edited by Kunio Esumi and Minoru Ueno, Marcel Dekker Inc. New York (1997) presents an excellent treatment of theory in viscosity along with reference (page 304) to "ternary systems of zwitterionic or nonionic surfactants, aliphatic alcohols as co-surfactants, and water". The material from pages 315 to 321 focuses on thoughts in "drag reducing surfactants".

Rounds, R. S., "Rheology of Liquid Detergents," Surfactant Science Series Volume 67, pp. 67-127, edited by Kuo-Yann Lai, Marcel Dekker Inc., New York (1997) indicates use of acids with water and surfactants (page 70); a discussion of interactive regions in solution, gel, and dispersion domains (pages 84 – 97); and a description of interactions in polymer-surfactant blends (page 116 and ff).

Hoffman, Heinz and Heinz Rehage, "Rheology of Surfactant Solutions," Surfactant Science Series Volume 22, pages 209-232, edited by Raoul Zana, Marcel Dekker Inc., New York presents detail in general viscosity and concentration relationships (pages 218 and ff).

Nasr-El-Din, H. A., D. Schriemer, and A. S. Abd-El-Aziz, Chapter 11, "Liquid Crystal Formation and Its Effect on the Flow Properties of an Anionic Surfactant," in Dynamic Properties of Interfaces and Association Structures, pp. 206-230, edited by Vinod Pillai and D. O. Shah, AOCS Press, Champaign, Ill. (1996) examines viscosity behavior in surfactant-salt blends.

Lalanne-Cassou, C. et al., "Minimizing Cosolvent Requirements for Microemulsion Formed With Binary Surfactant Mixtures," J. Dispersion Science and Technology, 8(2), pp. 137-156, (1987) provides guidance in the purposeful construction of mixtures of synthetic surfactants which can minimize or eliminate alcohol requirements.

Loughney, T. J. et al., "The Determination of HLB and Solvent HLB Values for Mono and Dialkylated Mono and Disulfonated Diphenyl Oxides," World Surfactants Congr., 4th, 1996, 2, pp. 462-474 discusses the determination of HLB and solvent HLB values for mono and dialkylated mono and disulfonated diphenyl oxides. The discussion of the present specification on pages 4 and 5 recaps chemistry and nomenclature of page 463 in the Loughney, et al., reference.

CA 121:234426n, JP 06,172,773, Chiba, Tsunenori et al., "Lubricant Compositions Containing Alkylphenyl Ether Sulfonates for Polyalkylene Terephthalate Vessels" discusses lubricant compositions containing alkylphenyl ether sulfonates for polyalkylene terephthalate vessels. (Lubricants containing water-soluble fatty acid alkali salts contain alkyldiphenyl ether disulfonate salts for prevention or suppression of stress cracking of polyalkylenetetraphthalate vessels. The water-

soluble fatty acid alkali salts may be coconut oil fatty acid, lauric acid, oleic acid, or beef tallow fatty acids salts with Na, K, or alkanolamine.)

Dawe, Bob et al., "Reduced Adsorption and Separation of Blended Surfactants on Sand and Clay", J. Can. Pet. Technol., 1991, 30(2), pp. 133-7 is directed to oil recovery using DOWFAX™ (trademark of the Dow Chemical Company) disulfonated alkyldiphenyloxide surfactants with AOS (alpha olefin sulfonate) surfactants in sodium chloride and other brine solutions.

A final reference dealing with management of petroleum viscosity is Research Disclosure 167077 (disclosed anonymously, March 1978) entitled "DiSulphonated Surfactant for Enhanced Oil Recovery – Comprising Mono: Alkylated DiPhenyl Ether DiSulphonate(s) giving High Solubilisation of Petroleum Sulphonate(s) in Brine" which discusses improved disulfonated surfactant compositions for enhanced oil recovery processes.

A copy of all cited patents and printed publications is enclosed. As noted earlier, the Examiner is requested to review each reference and formulate his/her own understanding thereof.

Applicants do not perceive that a fee is due, however, if one is due please charge our Deposit Account No. 04-1512 accordingly.

Respectfully submitted,

Dale H. Schultz
Registration No. 36,267
Phone: (517) 636-5355

P. O. Box 1967
Midland, MI 48641-1967

DHS/jsh

FORM 1449

INFORMATION DISCLOSURE STATEMENT

(Use Several Sheets if necessary)

ATTY DOCKET NO.	SERIAL NO.
44522	09/608,585
APPLICANT: David E. Wallick, et al.	
FILING DATE: June 30, 2000	GROUP: 1714

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE *IF APPROPRIATE*
		2,854,477	9/30/58	Steinhauer	260	512	
		2,990,375	6/27/61	Steinhauer et al.	252	138	
		3,027,223	3/27/62	Teot	8	125	
		3,264,242	8/2/66	Teot	260	29.6	
		3,634,272	1/11/72	Valenta et al.	252	153	
		3,645,906	2/29/72	Valenta et al.	252	171	
		3,945,437	3/23/76	Chiu et al.	166	305	
		3,969,258	7/13/76	Carandang et al.	252	106	
		4,013,569	3/22/77	Chiu et al.	252	8.55	
		4,106,901	8/15/78	Bishop et al.	8	139	
		4,135,878	1/23/79	Bishop et al.	8	139	
		4,269,749	5/26/81	Marriott et al.	260	29.6	
		4,287,077	9/1/81	Wing	252	75	
		4,645,623	2/24/87	Dolan et al.	252	558	
		4,687,593	8/18/87	Dolan et al.	252	182	
		4,701,276	10/20/87	Wyman	252	62.52	
		4,757,833	7/19/88	Danley	137	13	
		4,800,036	1/24/89	Rose et al.	252	102	

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	PUBLICATION DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION YES / NO

OTHER DISCLOSURES (Including Author, Title, Date, Pertinent Pages, Place of Publication, Etc.)

	/	Carter, Tracee et al., "Increasing the Soluability Enhancement of Anionic DOWFAX Surfactants," Separation Science and Technology, 33(15), pp. 2363-2377, 1998.
	/	"More Solutions to Sticky Problems – A Guide to Getting More from Your Brookfield Viscometer," Brookfield Engineering Laboratories, Inc., July, 1996.

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		4,806,256	2/21/89	Rose et al.	252	71	
		4,820,429	4/11/89	Lim	252	8.554	
		4,950,424	8/21/90	van der Hoeven et al.	252	540	
		4,975,110	12/4/90	Puritch et al.	71	113	
		5,000,262	3/19/91	Danzik	166	272	
		5,015,367	5/14/91	Klimpel et al.	209	166	
		5,085,789	2/4/92	Yokouchi et al.	252	62.52	
		5,136,088	8/4/92	Farmer et al.	562	88	
		5,203,411	4/20/93	Dawe et al.	166	274	
		5,273,682	12/28/93	Danzik	252	320	
		5,298,529	3/29/94	Narayanan	514	788	
		5,373,064	12/13/94	Konishi et al.	525	357	
		5,585,341	12/17/96	Van Eenam	510	365	

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	/	"Chapter 9 – Rheology," in Shaw, Duncan J., Introduction to Colloid and Surface Chemistry, 4th Edition, Butterworth-Heinemann Ltd., Oxford, UK (1992).
	/	Boese, Roland; Hans-Christoph Weiss, and Dieter Blaser, "The Melting Point Alternation in the Short-Chain n-Alkanes: Single-Crystal X-Ray Analyses of Propane at 30 K and of n-Butane to n-Nonane at 90 K," Angew. Chem. Int. Ed., 38 (7), 988-992 (1999).
	/	Rosen, Milton J., Surfactants and Interfacial Phenomena, Second Edition, John Wiley & Sons, New York (1989).
	/	Keenan, M. J. and M. A. Krevalis, "Carboxylic Acids (Survey)" in Kirk-Othmer Encyclopedia of Chemical Technology, 4th Edition, edited by Mary Howe-Grant Kroschwitz, John Wiley & Sons, New York (1992).
	/	Sjoberg, Marie and Torbjorn Warnheim, "Nonaqueous Surfactant Systems," Surfactant Science Series Volume 67, pp. 179-205, edited by Kuo-Yann Lai, Marcel Dekker Inc., New York (1997).

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FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	PUBLICATION DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION YES	NO
	✓	875551	11/04/98	Europe				
	✓	WO 94/05759	03/17/94	PCT				
	✓	2,050,627	03/08/92	Canada				
	✓	9640857	01/23/97	Australia				
		3,634,644	04/30/87	Germany			X	

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	✓	Hoffman, Heinz and Werner Ulbricht, "Viscoelastic Surfactant Solutions," Surfactant Science Series Volume 70, pp. 285-324, edited by Kunio Esumi and Minoru Ueno, Marcel Dekker Inc. New York (1997).
	✓	Rounds, R. S., "Rheology of Liquid Detergents," Surfactant Science Series Volume 67, pp. 67-127, edited by Kuo-Yann Lai, Marcel Dekker Inc., New York (1997).
	✓	Hoffman, Heinz and Heinz Rehage, "Rheology of Surfactant Solutions," Surfactant Science Series Volume 22, pp. 209-239, edited by Raoul Zana, Marcel Dekker Inc., New York.
	✓	Nasr-El-Din, H. A., D. Schriemer, and A. S. Abd-El-Aziz, Chapter 11, "Liquid Crystal Formation and Its Effect on the Flow Properties of an Anionic Surfactant," in Dynamic Properties of Interfaces and Association Structures, pp. 206-230, edited by Vinod Pillai and D. O. Shah, AOCS Press, Champaign, Ill. (1996).
	✓	Lalanne-Cassou, C. et al., "Minimizing Cosolvent Requirements for Microemulsion Formed With Binary Surfactant Mixtures," J. Dispersion Science and Technology, 8(2), pp. 137-156, (1987).
	✓	"Supersolubilization in Mono- and Dialkyl Diphenyloxidedisulfonate Solutions," Presentation by Wu, Bin et al, University of Oklahoma, September 9, 1998.
	✓	Loughney, T. J. et al., "The Determination of HLB and Solvent HLB Values for Mono and Dialkylated Mono and Disulfonated Diphenyl Oxides," World Surfactants Congr., 4th, 1996, 2, pp. 462-474.
	✓	CA 121:234426n, JP 06,172,773, Chiba, Tsunenori et al., "Lubricant Compositions Containing Alkylphenyl Ether Sulfonates for Polyalkylene Terephthalate Vessels".
	✓	Dawe, Bob et al., "Reduced Adsorption and Separation of Blended Surfactants on Sand and Clay", J. Can. Pet. Technol., 1991, 30(2), pp. 133-7.
	✓	Research Disclosure167077, Improved disulfonated surfactant compositions for enhanced oil recovery processes, Disclosed anonymously, March 1978

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